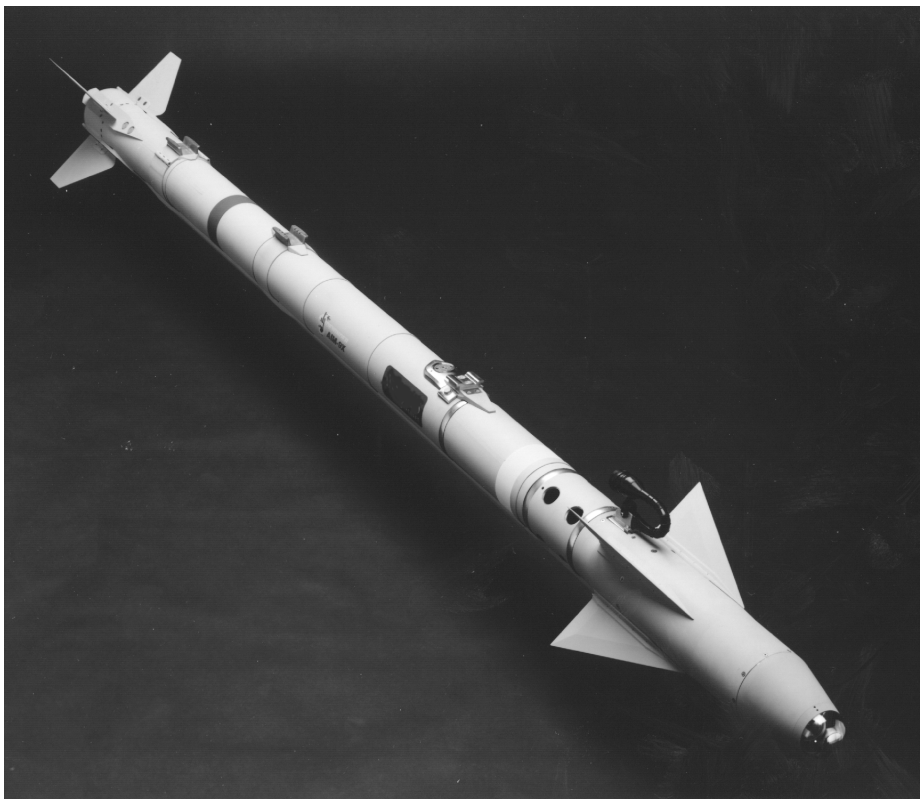
AIM-9X SIDEWINDER AIR-TO-AIR MISSILE



Navy ACAT ID Program

Total Number of Systems:	10,097
Total Program Cost (TY$):	$3.0B
Average Unit Cost (BY97$):	$245K
Full-rate production:	1QFY04

Prime Contractor

Raytheon Systems Company

SYSTEM DESCRIPTION & CONTRIBUTION TO JOINT VISION 2020

The multi-Service AIM-9X Sidewinder Air-to-Air missile program is a follow-on modification to the existing AIM-9M short range missile, for both the U.S. Air Force and Navy/Marine Corps fighters. AIM-9X is designed to be a highly maneuverable, launch and leave missile, capable of engaging multiple types of targets using passive infrared guidance to provide full day/night capability with improved resistance to countermeasures, expanded target acquisition, and high off-boresight improvements relative to the AIM-9M. AIM-9X is designed to work with any on-board aircraft cueing source, including the Joint Helmet-Mounted Cueing System (JHMCS), which is being developed in a parallel program to enhance high off-boresight capability.

The AIM-9X missile retains the warhead, fuze, and rocket motor of the existing Sidewinder missile family. A new imaging infrared focal plane array seeker, thrust-vectored tail-control actuation system, and state-of-the-art signal processor/auto pilot should provide the missile with performance improvements over AIM-9M.

AIM-9X will be employed in both offensive and defensive counter air operations. It will contribute to the ***Joint Vision 2020*** objectives of ***precision engagement*** in the offensive counter air role and to ***full-dimensional protection*** in the defensive counter air role. The F-15C/D and F/A-18C/D will be the initial fighter platforms for AIM-9X integration and testing; the missile will be integrated with the F-16, F/A-18E/F, F-15E, and F-22 later.

BACKGROUND INFORMATION

AIM-9X development was initiated in response to the development and fielding of new foreign missiles clearly exceeding AIM-9M capabilities. An 18-month AIM-9X competitive DEM/VAL program began in 1994 with the Hughes Missile Systems Company and the Raytheon Company. At the conclusion of this Dem/Val program, Hughes was selected as the AIM-9X prime contractor in December 1996. An evaluation of the British ASRAAM missile, conducted in parallel with the AIM-9X Dem/Val phase, including a 18-month Foreign Comparison Test, showed that it did not meet all of the U.S. performance requirements.

The AIM-9X program is a joint Navy/Air Force program, with the Navy designated as the Executive Service. It is also an acquisition reform program in which the contractor bears total system performance responsibility for a weapon system that meets the Performance Specification (AS-5780) derived from the Operational Requirements Document (ORD). The contractor, now Raytheon Systems Company through a merger with the Hughes Missile Systems Company, is developing AIM-9X through an Integrated Product Team (IPT) management approach including Navy, Air Force, and OSD membership. The EMD phase began in January 1997, and is currently planned for completion in approximately six years, with Milestone III scheduled for 3QFY03.

TEST & EVALUATION ACTIVITY

AIM-9X test and evaluation activity has proceeded from laboratory and captive carry development and demonstration tasks to missile test launches from F-15s and F/A-18C/Ds. Twelve of sixteen planned separation and control test vehicle (SCTV) launches were conducted to demonstrate safe separation and missile aerodynamic performance. The first three launches were successful. The fourth launch was not, due to a structural failure of the external harness cover resulting in separation of the electrical wiring to the control actuation system. The subsequent eight launches have demonstrated a fix for the harness cover design. An additional spare SCTV was launched to validate a new aft missile hanger design corrected launcher for damage previously seen on high G launches of both AIM-9X and existing legacy AIM-9M from the F/A-18C/D wingtip stations—the fix worked. One SCTV, planned to induce missile flutter if present, was inadvertently dropped into the Gulf of Mexico on the Eglin AFB test range after an uncommanded jettison from an F-15 (aircraft jettison switch wiring problem). Within two weeks, the AIM-9X program launched a spare SCTV, which showed no evidence of flutter.

During the DT-IIB/C test phase of the program, four Engineering Development Model (EDM) guided missiles and one Production Representative Model (PRM) guided missile have been successfully launched. The first EDM, which was an aft quarter shot, (better than the AIM-9M capability) destroyed the QF-4 drone. The second EDM killed a QF-4 drone in a head-on, lookdown, shoot-down attack over land with acquisition ranges in clutter superior to AIM-9M. The third shot was a wide miss. As a result, tracker algorithm problems were identified and corrected. The final EDM DT shot was a one circle

engagement (better than the AIM-9M capability) against a QF-4 drone in a desert background with infrared countermeasures (IRCM). The aircrew utilized the Joint Helmet Mounted Cueing System (JHMCS) as a cueing source in this high off-boresight launch. The missile passed within lethal range for a kill of the QF-4 drone. The first PRM launch successfully intercepted the QF-4 drone (target in a beam aspect dispensing IRCM against desert background).

In the OT-IIA Operational Assessment, all five EDM launches have been completed using operational representative scenarios. JHMCS was also employed as a cueing source on three of these shots. Four EDM firings were direct hits and one EDM (target in a beam aspect dispensing IRCM against desert background) missed. The known throughput limitations of the EDM hardware, coupled with attendant software workarounds, contributed to this miss. Though conducted earlier in the calendar year, due to operational test resource availability, the DT PRM shot, mentioned above, was conducted in a target in a beam aspect scenario while dispensing countermeasures, and was successful. Based on simulation runs and this successful PRM launch, the PRM missiles have demonstrated significant improvement in throughput capability.

Modeling and simulation (M&S) tools are key contributors to the development and evaluation of AIM-9X. Due to this missile's expanded capabilities and cost constraints on the number of test launches, a family of simulations will be used to assess missile performance across a wide spectrum of engagements (encompassing various threats, backgrounds, and countermeasures). These simulations will approximate the missile's performance in target detection and acquisition, fly out to the target, and end game warhead fuzing and lethality. The live missile launches will be primarily used to validate these simulations. Since the same simulations will be used for the OT&E and DT&E phase, DOT&E and the OTAs have been involved in the AIM-9X program's intensive M&S planning from the program start. From an independent Draper Lab assessment of the M&S strategy, through the decision to contract with the Joint Accreditation Support Activity to assist in validation of the simulations, DOT&E has actively monitored M&S planning and operations. Validation, verification, and accreditation plans were developed for DOT&E approval. Technical review panels and accreditation panels continue to review M&S activities to support accreditation for LRIP and Milestone III decisions. This active involvement will continue throughout this challenging and important contractor/government task in EMD

The Live Fire Test and Evaluation program consisted of three warhead (same warhead as AIM-9M) characterization (static) tests, to determine if the added wiring harness and cover affected warhead performance. Testing was conducted March-April 2000 at China Lake, CA. The classified test data is being analyzed to determine if the warhead model requires revision. The LFT&E program was expanded when a primary threat target became available for testing. Static arena testing of the AIM-9X warhead against this target was conducted from September-October 1999 at Dahlgren, VA. This testing demonstrated the lethality of the AIM-9X warhead against its primary target for several expected endgame geometries. Test results will also support validation of the Joint Service Endgame Model, which will be used in determination of AIM-9X probability of kill.

TEST & EVALUATION ASSESSMENT

The AIM-9X development program was restructured in FY00 to compensate for an 8-month delay in the start of flight testing and the zeroing of FY00 procurement funding by Congress. The restructured schedule impact on OT&E resulted in shifting the final OT period from December 2000-October 2001 to December 2001-September 2002. Milestone III has also shifted from May 2002 to May 2003. The Congressional zeroing of the planned FY00 procurement forced the first of three planned LRIPs to begin 1QFY01. The APB and TEMP have been staffed reflecting these changes and the AIM-

9X program has been successfully executing the restructured program for 8 months having conducted over 495 captive, dress, and live launch missions. A fortuitous result of this schedule change is that more mature production representative missiles will be available for OT&E launches.

Development of the simulation suite is progressing well. Contractor and government stakeholders are cooperating in solving the simulation and interface problems as they occur. Validation of the simulation suite continues to be done with both the SCTV missile firings as well as the guided missile firings, including both the EDM and PRM missiles. Simulation strategy and planning is documented in the current TEMP revision approved by OSD in July 2000. This TEMP update restructured the test program to reflect the program schedule change, as well as support the FY00 119-missile LRIP budget request.

The simulation results from past Weapon System Performance Reviews (WSPR) have been based on EDM hardware and software. Although the EDM configuration meets ORD thresholds against blue-sky backgrounds, it does not currently meet ORD thresholds against targets dispensing countermeasures. However, the PRM configuration is expected to continue maturation of tracker hardware and software as planned to meet ORD probability of kill (Pk) thresholds against the threat target employing countermeasures in clutter backgrounds. The fifth WSPR, held in August 2000, presented the improved AIM-9X capability resulting from the changes made to PRM processor hardware and tracker software. Although 15 months of developmental testing still remain before OT&E, Pk values in IRCM and clutter, that approach ORD thresholds, are expected. DOT&E will closely monitor the program's progress in this area.

After completion of the OT-IIA Operational Assessment, approximately eleven more developmental PRM launches are planned before OT-IIB OT&E begins in December 2001.

CONCLUSIONS, RECOMMENDATIONS AND LESSONS LEARNED

The AIM-9X program demonstrates the benefits of a cooperative IPT approach by involving the prime contractor, program management, Air Force and Navy test organizations, AFOTEC/COMOPTEVFOR, and OSD in developing a practical and credible simulation strategy supporting missile development and operational test and evaluation.

The AIM-9X program has invested heavily in modeling and simulation to support development and testing, including simulation of potential threats, backgrounds, and countermeasures. This simulation suite is being relied upon to guide development of the new missile seeker and tracker, especially in providing acceptable capability against countermeasures. An independent service and OSD team has accredited the AIM-9X simulation suite for the September 2000 LRIP DAB. These simulation initiatives have allowed the number of guided test missiles to be significantly reduced. The AIM-9X program is conducting up to 27 developmental test (10 of 11 successful to date) and 22 OT&E guided missile launches. This can be compared to 103 development and 69 OT&E guided launches that the AMRAAM program conducted in the 1980s. Accordingly, if test results with these few missiles do not meet operational requirements or do not agree with simulation results, additional test missile firings will be required.